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(54) Title: ENERGY FOOD PRODUCT

(57) Abstract: An energy multi-saccharide food product including: a saccharide component including 5 to 20 % w/w galactose; 0 to 25 % w/w creatine; and optional further ingredients selected from: carbohydrate, fibre and fat.

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## ENERGY FOOD PRODUCT

This invention relates to high energy multi-saccharide food products containing the substance galactose, which find use as an ergogenic aid, particularly but not exclusively for persons participating in sports or other forms of exercise. The products of this invention also find use in cases of hunger or fatigue in the general population.

Exercise makes excessive demands on substrates both within and external to the muscle. Carbohydrates are especially important as precursors of glycogen both in liver and muscle and as an energy source which can be used immediately. Accordingly there is a need for a short term energy supply during anaerobic and aerobic conditions. It is also a requirement for carbohydrates which serve as precursors either directly or indirectly for synthesis of glycogen in liver and muscle. Muscle cannot function efficiently or at a high level of power output if reserves of glycogen are low or sub-optimal. Depletion of glycogen in athletes results in poor performance and poor efficiency. Use of specific carbohydrates as an ergogenic aid has been proved to increase or maintain the stores of glycogen and availability of blood glucose.

The food products of this invention may comprise chewable or edible bars, sweets, cookies, biscuits, lozenges or chewing gum. Chewable or edible bars are preferred.

According to the present invention a high energy multi-saccharide food product comprises a saccharide component including 3 to 37% w/w galactose, 0 to 25% w/w of creatine and optional further ingredients selected from carbohydrate, fibre and fat.

Amounts and percentages in this specification are by weight unless indicated otherwise and are selected to total 100%.

The amount of galactose is preferably 5 to 20%, more preferably 5 to 15%.

The saccharide component also includes glucose. In a first preferred embodiment equal amounts of glucose and galactose are provided. In a second preferred embodiment the amount of galactose is greater than the amount of glucose.

Use of galactose affords several advantages. It is not insulogenic, that is it does not itself induce an insulin response, hence its use is associated with less of an insulin response than the equivalent mass of glucose. Products in accordance with this invention may be used by diabetics or persons who are intolerant to lactose. Galactose can be used

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rapidly by the liver for synthesis of glycogen or glucose. It is less likely to cause dental erosion than other sugars.

Use of creatine is optional. Preferred embodiments of the invention incorporate 10 to 25% creatine. The use of creatine is preferably such that the conversion to creatinine is inhibited. This conversion is a natural equilibrium. Creatinine is rapidly excreted by the kidneys. In order to minimise or prevent conversion to creatinine it is preferred that the creatine is encapsulated as granules or powder in a dry water-impervious shell. Micro-encapsulation is preferred. In this way the creatine is released in the stomach by dissolution. Alternatively the creatine may be isolated from the moist part of an edible bar by formulation in layers alternatively or in addition to encapsulation. For example the creatine may be contained in a separate layer of the food bar or lozenge.

Food products in accordance with this invention are useful in general cases of creatine depletion, for example in vegetarians or individuals where build-up of muscle function is needed or is clinically advisable.

Exercise makes excessive demands on substrates both within and external to muscle. Creatine phosphate is derived from both dietary creatine and from endogenous synthesis. Creatine phosphate is essential for short term energy supply during anaerobic conditions and also for energy transfer from mitochondria to contractile muscle. Muscle cannot function efficiently or at a high level of power output if reserves of creatine are low or sub-optimal. Depletion of creatine in athletes causes poor performance and poor efficiency.

Galactose may be provided as a pure ingredient which is mixed with glucose, starch and other ingredients during manufacture. Alternatively a glucose-galactose syrup such as may be prepared by hydrolysis of lactose may be employed. The amount of galactose in such a syrup may be supplemented by additional pure galactose.

Use of fibre in the bar is advantageous because different fibre products influence the release of sugars, affect the binding of various components and advantageously delay digestion. An amount of 0 to 5% may be employed. Furthermore the galactose or galactose-glucose syrup may be absorbed onto the fibre prior to manufacture. In this way the absorption of galactose may be retarded.

In an alternative embodiment the food products may have an external coating containing galactose in order to facilitate rapid absorption of galactose.

Formulations having a higher concentration of galactose are preferred in order to enhance galactose up-take by the liver and rapid production of glycogen. Increased amounts of galactose decrease the amount of lipid manufactured from glucose. Galactose is not a direct fat precursor. This is advantageous as lipids do not afford a rapid energy source.

The invention is further described by means of example but not in any limitative sense.

The following Tables and Examples list the ingredients of compositions of food products in accordance with this invention. These products may be manufactured into bars, sweets or lozenges using conventional methods.

In a layered arrangement the creatine powder or aggregate may be covered with a hard dry sugar layer. Alternatively or in addition a chocolate containing layer may be used as a moisture barrier. The creatine containing layer may be provided as a laminar cylindrical layer disposed within the bar as the inner layer. In this way the creatine containing component may be encapsulated. Alternatively or in addition ingredients such as fibre, nuts and dried fruit may be layered onto the creatine to form a laminate. The fibre layer may incorporate syrup to form a composite layer.

The outermost layer of the bar or other food product may comprise a single thin layer of hard sugar for example composed of galactose or a mixture of galactose with glucose or sucrose. Such an arrangement of the sugar layer dissolves rapidly when portions of the bar pass into the stomach.

In alternative food products the creatine powder or aggregate may be covered with a hard sugar mixture, chocolate or both to form particles with a mass of 100 to 500 mg. These can be combined with the remaining ingredients to form dispersed units within the matrix, for example as chocolate chips within a cookie. Such an encapsulated arrangement may incorporate layers as previously described.

The following tables contain general ranges of preferred ingredients.

TABLE 1

Ingredient	Range (% w/w)	Comments
Carbohydrate	50-75	Mono, di, oligosaccharides, syrup etc.
Fat	0-10	Saturated and unsaturated
Fibre	0-10	
Creatine	0-25	As monohydrate
Protein	0-15	
Vitamins	50-100% of RDA	Full range
Galactose	5-20	
Dried Fruit	0-15	
Seeds and Nuts	0-15	
Glucose	0-10	
Flavours	As necessary	
Stabilisers	1-3	
Water	0-30	

TABLE 2

	Example 1	Example 2	Example 3	Example 4	Example 5	Example 6
Cornstarch	20g	10g	20g	10g	10g	8g
Maltodextrin	20g	10g	20g	10g	10g	8g
Raw cane sugar	2g	2g	2g	2g	2g	2g
Fructose	3g	3g	3g	3g	3g	--
Refined cane sugar	5g	5g	5g	5g	5g	--
Glucose	5g	5g	--	--	5g	5g
Galactose	5g	5g	--	--	5g	5g
Glucose/Galactose syrup	--	--	10g	10g	--	--
Fat	10g	10g	10g	10g	10g	5g
Fibre	5g	5g	5g	5g	5g	5g
Creatine	--	20g	--	20g	--	20g
Vitamins	1g	1g	1g	1g	1g	1g
Protein	10g	10g	10g	10g	10g	7g
Flavours	1g	1g	1g	1g	1g	1g
Stabilisers	2g	2g	2g	2g	2g	2g
Water	11g	11g	11g	11g	11g	11g
Fruit	--	--	--	--	10g	10g
Seeds and Nuts	--	--	--	--	10g	10g

	Example 7	Example 8	Example 9	Example 10	Example 11	Example 12
Cornstarch	20g	10g	20g	10g	10g	8g
Maltodextrin	20g	10g	20g	10g	10g	8g
Raw cane sugar	2g	2g	2g	2g	2g	2g
Fructose	3g	3g	3g	3g	3g	--
Refined cane sugar	5g	5g	5g	5g	5g	--
Glucose	5g	5g	--	--	5g	5g
Galactose	5g	5g	--	--	5g	5g
Glucose/Galactose syrup	--	--	10g	10g	--	--
Fat	10g	10g	10g	10g	10g	5g
Fibre	5g	5g	5g	5g	5g	5g
Creatine	--	20g	--	20g	--	20g
Vitamins	1g	1g	1g	1g	1g	1g
Protein	10g	10g	10g	10g	10g	7g
Flavours	1g	1g	1g	1g	1g	1g
Stabilisers	2g	2g	2g	2g	2g	2g
Water	5g	5g	5g	5g	5g	5g
Fruit	3g	3g	3g	3g	13g	13g
Seeds and Nuts	3g	3g	3g	3g	13g	13g

	Example 13	Example 14	Example 15	Example 16	Example 17	Example 18
Cornstarch	15g	5g	15g	5g	5g	8g
Maltodextrin	15g	5g	15g	5g	5g	8g
Raw cane sugar	2g	2g	2g	2g	2g	2g
Fructose	3g	3g	3g	3g	3g	--
Refined cane sugar	5g	5g	5g	5g	5g	--
Glucose	5g	5g	--	--	5g	5g
Galactose	5g	5g	--	--	5g	5g
Glucose/Galactose syrup	--	--	10g	10g	--	--
Fat	10g	10g	10g	10g	18g	3g
Fibre	5g	5g	5g	5g	2g	2g
Creatine	--	20g	--	20g	--	20g
Vitamins	1g	1g	1g	1g	1g	1g
Protein	5g	5g	5g	5g	5g	2g
Flavours	1g	1g	1g	1g	1g	1g
Stabilisers	2g	2g	2g	2g	2g	2g
Water	20g	20g	20g	20g	20g	20g
Fruit	3g	3g	3g	3g	13g	13g
Seeds and Nuts	3g	3g	3g	3g	8g	8g



## CLAIMS

1. An energy multi-saccharide food product including:  
a saccharide component including 3 to 37% w/w galactose;  
0 to 25% w/w creatine; and  
optional further ingredients selected from: carbohydrate, fibre and fat.
2. A food product as claimed in claim 1 comprising:

galactose	5 to 20%
creatine	0 to 25%
carbohydrate	50 to 75%
fat	0 to 10%
fibre	0 to 10%

and optional further ingredients, wherein the ingredients total 100%.
3. A food product as claimed in claim 1 or 2, wherein the amount of galactose is 5 to 20%, preferably 5 to 15%.
4. A food product as claimed in any preceding claim, wherein the saccharide component includes glucose.
5. A food product as claimed in claim 4 including equal amounts of galactose and glucose.
6. A food product as claimed in claim 3, wherein the amount of galactose is greater than the amount of glucose.
7. A food product as claimed in any preceding claim, wherein the amount of creatine is 10 to 25%.

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8. A food product as claimed in any preceding claim, wherein the creatine is encapsulated as granules or powder.
9. A food product as claimed in claim 8, wherein the creatine is microencapsulated.
10. A food product as claimed in any preceding claim, wherein the creatine is contained in a separate layer.
11. A food product as claimed in any preceding claim, having an outermost layer of hard sugar comprising galactose or a mixture of galactose and sucrose.

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/03995

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A23L1/09 A23L1/29 A23L1/30

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A23L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, BIOSIS, WPI Data, PAJ, FSTA

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 780 094 A (KING RODERICK FREDERICK GERARD) 14 July 1998 (1998-07-14)	1-6
Y	column 1, line 49 -column 1, line 56 column 2, line 1 -column 2, line 11 column 2, line 34 -column 2, line 37; claims 1-3,7; examples 1,2,7,8 ---	7-11
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Y	WO 96 18313 A (UNIV NOTTINGHAM ;GREENHAFF PAUL LEONARD (GB); GREEN ALLISON LESLEY) 20 June 1996 (1996-06-20) claims 2,6-10,14,15,17-19; example 1 --- -/--	7-11

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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